J Formos Med Assoc 2011;110(6):397–400

Contents lists available at ScienceDirect

Journal of the Formosan Medical Association

Journal homepage: http://www.jfma-online.com

Original Article

Use of Rubber Dams During Root Canal Treatment in Taiwan

*Hui-Ching Lin,[1,2] Sheng-Fang Pai,[2,3] Yeung-Yi Hsu,[2,4] Chin-Sung Chen,[5] Ming-Li Kuo,[2] Shue-Fen Yang[2,3]**

Background/Purpose: Isolation of teeth with rubber dams is an important procedure for infection control in dentistry, especially in endodontic treatment. This study surveyed the prevalence of rubber dam usage in nonsurgical root canal treatment (RCT) by dentists under the National Health Insurance system in Taiwan.
Methods: A total of 1,332 completed RCT cases were randomly selected from a large database from the Bureau of National Health Insurance in Taiwan in 2004. The radiographs and dental charts of the selected cases were evaluated for the prevalence of rubber dam usage in RCT. The frequencies of rubber dam usage for RCT by dentists were compared between hospitals and private dental clinics and among six different regions in Taiwan.
Results: The overall prevalence of rubber dam usage for RCT by dentists under the National Health Insurance system in Taiwan was 16.5%. The frequency of rubber dam usage for RCT by dentists in hospitals (32.8%) was significantly higher than that (10.3%) in private dental clinics ($p < 0.0001$). However, there was no significant difference in the frequency of rubber dam usage for RCT by dentists among six different geographic regions in Taiwan.
Conclusion: The prevalence of rubber dam usage for RCT by dentists in Taiwan is relatively low. Because rubber dam isolation of an endodontically-treated tooth can provide better infection control, increase patient protection, and improve treatment efficiency, there is an urgent need to advise dentists in Taiwan to use rubber dams for every RCT case.

Key Words: hospital, private dental clinic, root canal treatment, rubber dam

The use of rubber dams for dental treatments can achieve better infection control, patient protection, and treatment efficacy.[1] Cochran et al reported that rubber dam usage could reduce 90–98% of microorganisms spread during dental procedures.[2] Cases of swallowing or aspiration of endodontic instruments into the gastro-intestinal tract or lung during root canal treatment (RCT) have been reported.[1,3,4] These accidents can be effectively prevented by isolation of the tooth using a rubber dam. Furthermore, rubber dam isolation provides a clean and dry operative field free of contamination from blood or saliva, improves visibility by retracting the lips and cheeks, minimizes patient conversation, and enables a more efficient endodontic treatment for the tooth.[1]

[1]Taipei City Hospital, [2]Division of Endodontics and Periodontology, Department of Stomatology, Taipei Veterans General Hospital, [3]School of Dentistry, National Yang-Ming University, [4]Elite Dental Clinic, Taipei, and [5]Department of Dentistry, Cathy General Hospital - Sijhih, Taiwan.

Received: January 24, 2010
Revised: April 28, 2010
Accepted: April 29, 2010

***Correspondence to:** Dr Shue-Fen Yang, Department of Stomatology, Taipei Veterans General Hospital, 201, Section 2, Shih-Pai Road, Taipei 11217, Taiwan.
E-mail: sfyang@vghtpe.gov.tw.

The prevalence of rubber dam usage in endodontic treatment varied from 3% to 67% in different studies.[1] Many factors, like undergraduate training, dentist position in practice, and practice location have been suggested to significantly influence the frequency of rubber dam usage.[1] Silversin et al reported a rate of rubber dam usage in RCT to be 92.4% for undergraduate students, 13.6% for private practitioners, and 3.4% for National Health Service practitioners in the United Kingdom.[5]

In Taiwan, the national health insurance plan was implemented in March 1995. The National Health Insurance (NHI) is managed by the Bureau of NHI (BNHI), which insures approximately 21 million individuals from a total population of 22 million. Providers have to make a claim for each treatment to BNHI for payment; therefore, a large computerized medical and dental database for each insured individual is kept. The purpose of this study was to investigate the prevalence of rubber dam usage for RCT by dentists under the National Health Insurance system in Taiwan. Furthermore, the frequency of rubber dam usage for RCT by dentists was compared between hospitals and private clinics and among six different geographic regions in Taiwan.

Materials and Methods

Selection of cases

Random sampling of cases stratified by the geographic areas and the dental care institutions (hospital or private dental clinic) was performed. The sample size (n) was estimated to be 1200 so that the standard error (SE) of the estimate p could be controlled to be less than 0.05 via the formula $(\text{se})^2 = \hat{p}(1-\hat{p})/n$. According to the regulations of the BNHI, 5% of the RCT cases performed by dentists in hospitals and 10% of RCT cases performed by dentists in private clinics should be randomly selected and submitted to the BNHI for peer review. One to three cases were chosen from each randomly selected hospital or private dental clinic, according to the list of random numbers that was prepared by the statistician. A total of 1332 RCT cases (368 from 187 hospitals and 964 from 831 private dental clinics) were randomly selected from approximately 800,000 RCT cases of permanent dentition submitted to the BNHI for peer reviewing from August to November 2004.

Evaluation of the prevalence of rubber dam usage

The use of rubber dams for each RCT case was determined according to the interpretation of the periapical radiographs and dental charts. A group of eight endodontists were trained to read the submitted charts and radiographs using the same criteria. Rubber dam isolation was recognized and marked as positive, when a radiopaque clasp image could be identified from the radiographs or when performance of rubber dam isolation was recorded in the dental chart. Each set of periapical radiographs and dental charts from every selected case was assessed by one of the eight trained endodontists.

The results of rubber dam usage for RCT were analyzed. The frequency of rubber dam usage for RCT by dentists was compared between hospitals and private dental clinics and among six different geographic regions in Taiwan. The six geographic areas were Taipei, northern, central, southern, Kao-Ping, and eastern regions. Chi-square test was used for statistical analysis. A statistically significant level was set at $p < 0.05$.

Results

Thirty-six RCT cases from hospitals and 93 RCT cases from private dental clinics were excluded from this study because of incomplete submitted records. Thus, a total of 1203 RCT cases were evaluated for the use of rubber dams for tooth isolation. The distribution of the number and percentage of RCT cases with rubber dam application in hospitals or private dental clinics according to six different geographic regions in Taiwan are shown in the Table. The overall prevalence of rubber dam usage for RCT by dentists under the

Table. Distribution of the number and percentage of root canal treatment cases with rubber dam application in hospitals or private dental clinics shown for six different geographic regions in Taiwan[a]

	Taipei region	Northern region	Central region	Southern region	Kao-Ping region	Eastern region	Total
Hospital	26/81 (32.1)	21/74 (28.4)	13/39 (33.3)	19/47 (40.4)	23/64 (35.9)	7/27 (25.9)	109/332 (32.8)
Private dental clinic	21/153 (13.7)	11/167 (6.6)	11/160 (6.9)	19/153 (12.4)	18/165 (10.9)	10/73 (13.7)	90/871 (10.3)
Total	47/234 (20.1)	32/241 (13.3)	24/199 (12.1)	38/200 (19.0)	41/229 (17.9)	17/100 (17.0)	199/1203 (16.5)

[a]*Data are presented as n (%).*

National Health Insurance system in Taiwan was 16.5%. The frequency of rubber dam usage for RCT by dentists in hospitals (32.8%) was significantly higher than that (10.3%) in private dental clinics ($p < 0.0001$). The frequency of rubber dam usage for RCT by dentists was 20.1% for the Taipei region, 13.3% for the northern region, 12.1% for the central region, 19.0% for the southern region, 17.9% for the Kao-Ping region, and 17.0% for the eastern region. There was no significant difference in the frequency of rubber dam usage for RCT by dentists among six different geographic regions in Taiwan ($p > 0.05$).

Discussion

The prevalence of rubber dam usage for RCT by dentists has previously been studied by questionnaire.[1] Questionnaire studies often include a smaller sample size due to a low return rate. Furthermore, most returned mail is answered by responsible and cooperative dentists, resulting in a bias in the frequency of the rubber dam usage for RCT. This study chose to evaluate rubber dam usage from RCT cases submitted to the BNHI for peer review. In addition, we read the periapical radiographs and/or dental charts to assess the frequency of rubber dam usage for RCT. The specific design for case selection and evaluation made this study more unique and representative of the true clinical situation. One concern was that there were some patients who chose self-pay endodontist clinics for better-quality RCT. Another concern was that some hospitals and private dental clinics under the National Health Insurance system were not required to submit RCT cases for peer review, according to the regulations of the BNHI. These cases were thus excluded from this study.

Clinical implications for the use of rubber dams for RCT include the selection of root canal irrigant, patient safety, and treatment outcome.[1] Whitworth et al reported that the selection of irrigant for RCT is strongly linked to rubber dam usage.[6] In their study, 71% of rubber dam users chose NaOCl solution for root canal irrigation, compared with

38% of nonusers. Van Nieuwenhuysen et al demonstrated that the retreatment outcome is significantly better for RCT cases with rubber dam usage compared with those using cotton rolls for tooth isolation.[7] Abbott found that the most common factor associated with continuing pain in RCT was lack of use of rubber dams (87%).[8] The results of these studies indicate the importance of using rubber dams for RCT.

Various reasons have been cited for the low frequency of rubber dam usage. These include lack of patient acceptance, time required for application, insufficient training/lack of skills, cost of equipment and materials, and low treatment fees for RCT.[1] It has been shown, however, that the patients are generally not adverse to the use of rubber dams during RCT treatment.[1] The average time required to apply a rubber dam on an endodontically-treated tooth varied from 1.27 to 8 minutes.[1] However, this relatively slight loss of time can be compensated for by better working conditions offered by the rubber dam isolation.

Allergic reaction to rubber dams is also a concern by many clinicians. The incidence of rubber latex allergy has been reported to be 9.7% among patients and 6% among dental staff.[9,10] However, the latex-free rubber dam (polyethylene or polyvinylchloride) can be used as alternative materials if allergic reaction is a concern.

In the present study, there was a significant difference in the frequency of rubber dam usage for RCT by dentists in hospitals compared with private dental clinics (32.8% *vs*. 10.3%). Mala et al reported that dentists abandon the rubber dam after leaving dental schools.[11] There was no significant difference ($p > 0.05$) in the frequency of rubber dam usage for RCT among six geographic regions; however, in each different geographic region, the different frequency in rubber dam usage between hospital and private dental clinics still occurs.

The use of rubber dams has been accepted as a standard of care by professional organizations including European Society of Endodontology, American Association of Endodontists, and American Academy of Pediatric Dentistry.[1] This study found a low prevalence (16.5%) of rubber dam usage for RCT by dentists in Taiwan. Because rubber dam isolation of an endodontically-treated tooth receives better infection control, increases patient protection, and improves treatment efficiency, there is an urgent need to alert Taiwanese dentists to the use of rubber dams in every RCT case.

Acknowledgments

The authors extend their thanks to the Bureau of National Health Insurance in Taiwan for the help given during this study. This study was supported by the grant DOH92-HI-1003 from the Department of Health, The Executive Yuan, Taiwan, Republic of China.

References

1. Ahmad IA. Rubber dam usage for endodontic treatment: a review. *Int Endod J* 2009;42:963–72.
2. Cochran MA, Miller CH, Sheldrake MA. The efficacy of the rubber dam as a barrier to the spread of microorganisms during dental treatment. *J Am Dent Assoc* 1989;119:141–4.
3. Kuo SC, Chen YL. Accidental swallowing of an endodontic file. *Int Endod J* 2008;41:617–22.
4. Israel HA, Leban SG. Aspiration of an endodontic instrument. *J Endod* 1984;10:452–4.
5. Silversin JB, Shafer SM, Sheiham A, et al. The teaching and practice of some clinical aspects of endodontics in Great Britain. *J Dent* 1975;3:77–80.
6. Whitworth JM, Seccombe GV, Shoker K, et al. Use of rubber dam and irrigant selection in UK general dental practice. *Int Endod J* 2000;33:435–41.
7. Van Neuwenhuysen JP, Aouar M, Dhoore W. Retreatment or radiographic monitoring in endodontics. *Int Endod J* 1994;27:75–81.
8. Abbott PV. Factors associated with continuing pain in endodontics. *Aust Dent J* 1994;39:157–61.
9. Burke FJT, Wilson MA, McCord JF. Allergy of latex gloves in clinical practice: case reports. *Quint Int* 1995;26:859–63.
10. Hamann CP, Turjanmaa, Sullivan KM. Natural rubber latex hypersensitivity: incidence and prevalence of type I allergy in the dental professional. *J Am Dent Assoc* 1998;129:43–54.
11. Mala S, Lynch CD, Burke FM, et al. Attitudes of final year dental students to the use of rubber dam. *Int Endod J* 2009;42:632–8.